MENTOR HANDBOOK

for use in the

Science and Engineering Apprentice Program

for High School Students

"These kids are not afraid to ask the kinds of questions that force me and my colleagues to reexamine fundamental aspects of what were are doing. It refreshes all of us." Mentor.

THE GEORGE WASHINGTON UNIVERSITY
SCHOOL OF ENGINEERING AND APPLIED SCIENCE

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FOREWORD

The Department of Defense sponsored Science and Engineering Apprentice Program for High School Students was begun in 1980 in an effort to encourage more students to pursue scientific careers needed by the United States to meet the technological challenges of the future. More than 5,000 mentor/researchers have participated by working with student apprentices in a one to one relationship, primarily for eight weeks during one or more summers.

Details differ in the project implementation by each sponsoring agency. Certain common elements however, have been identified as important factors in making the apprenticeship experience of greatest benefit to all participants in the Program. These elements have been documented in three Handbooks: The Apprentice Handbook, The Mentor Handbook, and The Coordinator Handbook, to facilitate the continuation and growth of present projects and the development of new ones.

These Handbooks are based on the young people who have participated in the Program, the mentors who gave so much of themselves, and the management and administrative staff at the universities, laboratories and departments who made the Program possible. We anticipate even greater success in the effort to stimulate more young people to follow careers in science and engineering by the continuation and expansion of these programs.

The Part You Will Play in Your Apprentice's

"The greatest influence on my choice of study and work has been my keen interest in physics and deep sense of awe concerning the marvels of nature and the biological community...The interest was kindle during my SEAP apprenticeship and I am very grateful to have been given a chance to experience the research field from the 'inside' during that time. I sincerely hope that the program will be continued, if not expanded, in the years to come. It is a wonderful opportunity for young adults and I heartily thank you for granting me the privilege of participating in it."

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I. WELCOME

You have just joined a special group of scientists and engineers who have volunteered to be mentors to high school students this summer. Since 1980 almost 5,000 of your colleagues have served as mentors for high school students interested in pursuing science or engineering careers. The information in this handbook is based on experiences of mentors nationwide working with pre-college students in summer apprentice programs. It has been developed to help you understand the purposes of the program and your role as a mentor in designing an apprenticeship, selecting an apprentice, providing both direction and advice during the summer, and handling problems that might arise.

The Science and Engineering Apprentice Program for High School Students provides a summer learning experience for students, an opportunity for participating laboratories to identify future permanent employees in science and engineering, and productive short-term workers during the summer. You, as mentor to a student in a one-on-one relationship in this Program, are the key to the value of that summer experience.

II. HISTORY AND PURPOSES OF THE PROGRAM

The United States will certainly face a shortage of qualified scientists and engineers in the future in many areas. For reasons that range from lack of student interest to lack of enough qualified high school math and science teachers, our young people are not preparing themselves for careers in science and engineering in large enough numbers to meet the projected need. Our nation is faced with the challenge of acquiring and retaining the technological competence needed to ensure a strong national security, and a competitive international industrial position.

In the fall of 1979, the Director of the Office of Science and Technology Policy in the Executive Office of the President responded to this challenge. He requested Federal agencies to use their contract research programs to stimulate interest in careers in science and engineering among promising high school students, especially minorities and women who have been underrepresented in these fields.

The Department of Defense Apprenticeship Program was an example of a response to this request. Practicing scientists and engineers in DoD labs work one-to-one with high school students, primarily during the summer, and give them hands-on experience with scientific research. The program aims to foster their desire to pursue college-level training that would lead to careers in science and engineering. In 1980, more than 300 apprentices participated nationwide. By 1994 more than 750 apprentices participated in the program managed by The George Washington University alone.

The office of the Under Secretary of Defense for Research and Engineering provides overall leadership for the programs in laboratories throughout the nation. Within the laboratories themselves there are a variety of ways apprenticeship programs can be coordinated. The coordinator of your laboratory's program may be an interested scientist, someone in the civilian personnel office at your installation, a scientific officer responsible for contract research programs, or a private contractor who coordinates programs for a number of laboratories in an area.

Students hear about the Apprentice program through their high school science and math teachers and guidance counselors. They apply to the program coordinator at a central institution and are selected for a variety of scientific and engineering fields after interview by the mentor.

Generally, students participate for an eight-week period during their summer vacations after their sophomore, junior, or senior year of high school. Some are able to return during other school vacations or during the academic year. They have usually done well in science and math courses, are high achievers, are active in school and extra-curricular activities, and have been recommended by their teachers as able to benefit from, and contribute to, the apprenticeship experience. Most of the students selected already have a strong interest in science and may have taken the most advanced science courses their schools offer. However, many of the students do not yet know which of the sciences they want to pursue, or may not have a definite commitment to a career in the sciences.

III. **QUESTIONS MENTORS ASK**

What does it mean to be a mentor?

"Mentoring" is a tradition in the sciences, and many mentors participating in the program report having memories of certain teachers, supervisors, or friends who served as role models, gave guidance and inspiration, and helped them understand how to work with people and what it means to be a scientist. This kind of assistance, often voluntary and informal, is crucial to young peoples' successful entry into professions. As one mentor said, "It takes 20 years to develop a research scientist. The more help you get, the easier it is. People took time with me, so I'm willing to give it back."

The Science and Engineering Apprentice Program has some unique qualities that support your efforts to have an impact on a budding scientist. First, you interview applicants and select your apprentice personally. Not only does the student gain valuable experience in interviewing for a position, but you have an opportunity to choose someone who is compatible with your work style and research team. Second, once you select your student, the two of you can work at your own pace and tailor activities to meet your needs. Third, the Final Report that is required of each student helps to focus the student's efforts and gives you both some measurable results. In past years, some of these reports have contributed to actual publications, and have been presented at professional seminars.

What are the benefits to me of participating in the program?

* It brings fresh approaches to your research. One mentor remarked, "My staff sees how good this kid is and they all perk up. Productivity of the entire unit increases." another said, "Most students are willing to try anything and will usually do far more than I expect if I don't pre-limit them."

* You can get more work done. Mentors have published research papers, adapted computer systems, and catalogued specimens in a fraction of the time expected, with the help of apprentices. A mentor commented, "He reduced our research time from 6 weeks to 2 weeks. Based on his recommendations, I will be spending $80,000 this week."

* Your apprentice can return year after year under this program or others, which allows you to benefit from all the teaching you invest. A number of mentors who started out in their labs as high school students, work right through their doctorates with the help

of the scientists and with financial support from the laboratories. Now these people are themselves mentors of a new group of high school students.

What are my responsibilities as a mentor?

At most sites, you are expected to:

* Attend a mentor orientation.

* Interview several applicants, make a selection, and notify the applicants and the coordinator of your choice. Return applications of those students not selected to the coordinator, so they may be considered by other mentors.

* Design a project or designated tasks for the apprentice that will provide a mix of hands-on and theoretical experience. Keep in mind that some of the activities should be suitable for summarizing in the apprentices's Final Report and presentation.

* Designate an alternate mentor should you take vacation or be unavailable during the eight-week session.

* Spend as much time as you can with your apprentices, with an hour a day being average. This does not have to be all at one time. It is fine for them to work independently or with other staff members, as appropriate.

* Foster the apprentice's acceptance by your colleagues and staff.

* Serve as a guide, and interpreter, and an advisor.

* Answer questions.

* Counsel the apprentice on educational and career options as you become familiar with his/her capabilities, interests, and goals.

* Encourage and support the apprentice's participation in all enrichment activities that may be offered by the program, and the laboratory, brown bag lunches, field trips and seminars.

What are the apprentice's responsibilities?

* Attend orientation.

* Be present at all required times at the laboratory during the summer; time off due to serious illness or other extreme causes must be made up.

* Be a member of the project research team. Contribute to projects as instructed by the designated mentor; perform diverse tasks at various levels of complexity.

* Learn as much as possible about research techniques and the operation of the lab.

* Learn about educational and career opportunities in you laboratory, and in science and engineering in general.

* Become acquainted with the realities of scientific research: some routine work, some paper work, some excitement, some success, some frustration.

* Attend seminars, field trips, and other program enrichment activities as appropriate.

* Complete a Final Report and make a short presentation at the final session at the University.

What makes a good mentor?

Friendliness and the willingness to take time to answer a lot of questions were the two qualities most often mentioned by mentors and students alike as essential to mentoring. Other qualities mentioned were:

* Patience when mistakes are made; mistakes can promote learning.

* Willingness to let students work to the upper limits of their understanding, and knowing when to step in.

* Personal enjoyment of one's own career field.

* Voluntary desire to serve as a mentor.

There seem to be two approaches to mentoring: the task-oriented approach and the teaching-oriented approach. If you have a task orientation, you may prefer an apprentice who has specific academic preparation in your area and can quickly acclimate and produce a lot of results in eight weeks. You probably have specific tasks and outcomes in mind, and you feel that a structured experience will be most beneficial to your apprentice. The emphasis in this apprenticeship would be on depth, focusing for the most part on one particular project or topic.

If you have a teaching orientation, you may prefer an apprentice with a more general academic background, an alert curiosity, and a penchant for asking questions. Mentors with this orientation offer apprentices broad exposure to the laboratory and to a variety of projects and equipment. The emphasis here is on breadth, focusing on many projects, topics, or dimensions of the laboratory. Both approaches have merit, and the apprentice can benefit enormously either way. However you may prefer one approach to the other, or a combination of both. It is important that you identify your preference, so you can look for an apprentice who will work well with your style.

Occasionally there are mismatches. For example, one mentor chose an apprentice for her computer expertise. She was a whiz at any task he gave her. But as the summer wore on, he realized he really wanted someone with whom to discuss ideas and to ask him questions about the project. This apprentice really preferred completing specific tasks, without a lot of interaction. It gave her a sense of results. She was uncomfortable with a lot of brainstorming and discussion. By the end of the summer they spent less and less time together and the apprentice was less and less productive. Both ended up feeling disappointed by the experience.

Skillful interviewing of your applicants will often insure that there is a good match between your approach and the strengths and interests of the apprentice. Keep in mind which type of student you believe can most benefit from the opportunity of working with you. Some mentors prefer to select students who might not usually get this chance, because their records are spotty or inconsistent. These students are sometimes especially motivated. Some mentors select minority students or girls for the purpose of increasing their access to these fields. Sometimes, the program director or coordinator will make suggestions as to the kinds of students you should interview. While the choice is yours, it is important for you to remember what a pivotal experience an apprenticeship is to a student.

How can I get the most out of the interview?

Both you and the apprentice want a productive and satisfying summer, but it is easy to finish interviews with a feeling that you don't really know how to evaluate what you have heard. The following outline can be adapted for telephone interviews as well, although we really do not encourage that. It is fine to take notes and to encourage the student to take notes, too.

A. Getting comfortable

Show the students where they will be working if they are accepted, and talk a little about the kinds of projects being conducted. Concentrating on the environment at first will take the spotlight off them, and help put the students at ease. Ask them about hobbies, school, or what got them started in the sciences.

B. Getting a sense of the student's style

You already know about the students on paper. Since all the applicants are most likely well qualified, what you really need to know is whether your styles are compatible. Some questions to ask the student that could bring this out are listed below. You might want to answer some of these yourself so the student can get a better sense of how you prefer to work also.

* Can you tell me about a challenging project you worked on when you felt comfortable and productive?

* If you could invent an ideal task or job for yourself, what would it be? Why?

* Describe some qualities of an ideal supervisor.

* Describe some qualities of an ideal employee.

* Are you more interested in completing specific assignments that you completely understand or more interested in exploring unanswered questions?

* In what kind of environment are you most productive? Quiet or noisy? Lots of variety or one project? Informal or formal?

* Do you prefer working with others or working alone must of the time?

C. Closing the Interview.

Discuss any unusual aspects of the specific project to which certain students may be sensitive, i.e. use of animals in experiments, hazardous materials, security clearances, and direct use of your work in national defense.

Be sure to explain when they can expect to be notified of your selection decision if you do not inform applicants immediately.

How do I make the best selection of an apprentice?

To make the best selection it is wise to compare what you know about the applicants with what you know about your style and the needs of your laboratory. Here is a list of questions that may help to clarify your choice.

* Which student best matches my orientation to mentoring (task or teaching)?

* Which student's work habits are compatible with the environment?

* Which student could benefit the most by having this chance?

Once I've selected an apprentice, how do I design the tasks?

The apprentices are avid learners and hard workers. Their biggest complaint has been that there isn't enough to do. One way to prevent these complaints is to take a little advance time to write out a planning guide. This will assist you in organizing your thoughts and covering ground that is important to a successful apprenticeship. The following illustrates how some mentors said they started:

"I thought of what I learned when I was just starting out and what excited me the most. Then I designed tasks that would steer the apprentice to this same kind of excitement."

"I rotate kids through existing jobs so they get a little experience in each one."

"I took a little piece of what we were already doing and designed a task around that."

"I tried to shape a very broad experience. I developed an educational plan and stuck with it. We sat down and evaluated our progress at mid-summer and at the end."

"Tasks should be designed with two things in mind. First, the student has to get his or her hands wet doing something with an aim in mind. Second, there must be a reasonable amount of learning and variety."

"I look for a project that is short, has results, is of value to my work, and is within the scope of ability of a bright high school student."

"I assigned a project that related to current on-going research efforts that the apprentice's background could handle with minimum supervision."

Another strategy is to have ready a list of activities to occupy the inevitable times when things are slow. Some mentors suggested these:

* Lend the apprentice to a colleague for a day or two.

* Take a lower-priority project off the shelf to be studied and attempted.

* Give the apprentice materials related to their project(s) to read.

* Send the apprentice to the facility library to look up something related to the project.

* Have the apprentice interview people in other sections of your facility on what they're doing and write up a short report.

* Take or send the apprentice to scientific meetings or lectures, and ask him/her to give you an informal translation afterward.

* Have the apprentice design a ten-year career plan and ask three scientists to review it and offer constructive suggestions.

* Have the apprentice take a video taped short course in a new computer language or some specific skill.

What can I expect during the apprentice's first week?

Your apprentice will probably arrive with some initial trepidation. This apprehension will be less if the student knows the appropriate clothes to wear, the space he or she will occupy, and if the interview permitted meeting others and exploring the laboratory environment. For some apprentices, this will be their first formal "work" experience, and they may have to get used to extended concentration and commuting by public transportation.

Mentors have reported that apprentices go through several stages of adjustment. At first they often experience feelings of being excited by the challenge of a new experience. Within a few days, these can turn into feelings of being overwhelmed and frustrated at not being able to understand everything right away. This is the time when it is important for them to have concrete assignments that will give them a sense of accomplishment. After a few weeks, apprentices are usually familiar enough with the lab routines to have an overview of the summer and to pace themselves appropriately. Some tips for the first week:

* Start the apprentice out with some 4-8 hour concrete projects.

* Encourage him/her to ask you questions now. Your answers will help the apprentice acclimate quickly and shed his/her shyness.

* Take the apprentice to a scientific discussion meeting or lecture, if possible.

* Let her/him observe or "shadow" each staff member on the team for some short period of time when appropriate.

What enrichment activities may the program provide?

At most sites the apprentice's summer experience will be enhanced by opportunities to explore a wide variety of fields of science, and to see other laboratory environments. Coordinators of some programs will arrange for groups of apprentices to attend weekly seminars and/or brown bag lunches where they will hear various scientists discuss their research. These may be held at your installation, or site visits may be arranged to other locations. If no provision is made by the coordinator for these enrichment activities, you and your colleagues who are also serving as mentors may want to take the initiative to arrange lunch time meetings for apprentices. In addition, you might provide time for the apprentice to use your library and to talk to other researchers within your lab or in nearby laboratories.

What are the components of the apprentice's Final Report? How can I assist?

Many programs require apprentices to write short reports on their major research activities. The content of the reports will vary a great deal, but the format should resemble that of a scientific report. Your coordinator will probably give you an outline to use. A suggested format follows:

I. Cover sheet: names of student and mentor, title, date.

II. Acknowledgements: thanks to persons with whom the apprentice associated.

III. General description of research:

What was done
Why
Application of results
Place in larger research of laboratory

IV. Detailed description of research

Methodology: detailed enough to enable replication
Apparatus/equipment used

V. Results

What was observed, discovered
How data were analyzed
Conclusions/interpretations of data

VI. Other interesting observations and lessons learned from summer experience

VII. Bibliography

You can assist the apprentice with this project by encouraging him/her to keep a daily log of activities in a notebook. In the fifth week of the program help the apprentice begin to shape the content of the report by following the above, or a more suitable, outline. You may want to set deadlines and review drafts together.

It is crucial that you review and approve the report to insure that it is appropriate and does not violate any proprietary or security considerations. Since the student must make an oral report as well, it would be helpful for him/her to practice in front of a small group of peers with your supervision and feedback.

What do I do if my apprentice wants to return next summer?

Second Year Student

In most laboratories students can return for a second year SEAP as long as they have not yet entered college. If you as mentor, want the student back, it is only necessary for the apprentice to fill out the first page of the application indicating his/her desire to return to the same slot. The final decision is, of course, up to you. The lab coordinator or program director will have complete information.

The SEAP-CQL program enables you to continue your nurturing and productive relationship with your student during the college years. All funds given to the student must be supplied by you to the basic SEAP grant and will be transmitted to the student.

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We hope you find your role as a mentor a rewarding one for yourself, your laboratory, and your apprentice. We appreciate your participation in this program and hope you will urge your colleagues to become part of this effort to provide a sufficient base of trained scientific and technical professionals.

Appendix 1

SOME WORK/LEARNING OPPORTUNITIES AND FINANCIAL ASSISTANCE FOR SCIENCE AND ENGINEERING EDUCATION

Government, Including Military*

High School

Stay-In-School Federal Summer Aid Program. This program is primarily for students who need economic support to stay in school and who are to be recruited through State Employment Service Offices; but may be used to recruit summer apprentices directly who are not in need. Work hours under the Stay-in-School appointees may be converted to the Summer Aid authority during summer vacation periods, and their work periods may be extended to full-time.

Student Volunteer Service. Federal departments and agencies can establish programs designed to provide educationally related work assignments for student volunteers without pay. Volunteer programs must be conducted through written agreements with educational institutions (e. g. high schools, trade schools, junior colleges, and colleges) or with organizations officially designated by schools or boards of education to coordinate the placement of students in non-paid work assignments. In order to qualify, a student must be enrolled at least halftime in his or her school's academic program. Although student volunteers are not Federal employees, their service is creditable for competitive examination purposes. Some participating schools may award course credit for the service.

1040-Hour Appointment. Young people work up to 1,040 hours a year through their high school and college years as long as the work assignment is related to their academic study. This flexibility enables Federal laboratories to retain apprentices for several years, thereby increasing the apprentice's worth to the laboratory and research community, as well as reinforcing the positive scientific experiences the apprentice may have gained during his or her first summer.

* For information about civilian programs, contact U. S. Office of Personnel Management (OPM), 1900 E Street, NW, Washington, DC 20415.

Undergraduate

Cooperative Education Programs for Baccalaureate Students. Students are appointed in positions at grades GS-3 through 5. Generally two students fill one slot working six months full time and going to school for alternate six-month periods. The laboratory must have a current written working agreement with each college or university, which provides cooperative students. Agencies pay the student's tuition, although this comes with a commensurate obligation. Cooperative education students can be converted non-competitively to career-conditional appointments.

Federal Summer Employment Program. This program is designed to involve talented undergraduate and graduate students in operations of the federal government through summer employment at grades GS-2 to GS-11 depending on qualifications.

Federal Junior Fellowship Program. Fellows are exempt from normal employment ceilings. Candidates must have graduated from high school, have been in the upper 10% of their high school class, need an income to be able to attend college, be interested in Federal service after college (to which they must be admitted), and be nominated by their high school. Noncompetitive conversion is not possible.

ROTC (Reserve Officers Training Corps). ROTC scholarships are provided by each of the military Departments. Percentages targeted to students majoring in science or engineering vary each year depending on expected need. In 1989, the Army is providing about 12,000 scholarships, 55% targeted to students in science and engineering; the Navy, about 6,000, none targeted; the Air Force, about 7,500, at least 85% targeted; and the Marines, about 540, none targeted. For information, contact the respective local recruiting office.

Graduate

Cooperative Education Programs for Graduate Students. These appointments are made at GS-5 or GS-7 depending on the qualifications. Written agreements are necessary. Length of appointments must not exceed 30 months for masters and 42 months for Ph.D. Noncompetitive conversion is possible to permanent positions.

Fellowships. The Navy, Army, and Air Force each administer fellowship programs. The Office of Naval Research (ONR) awards up to 45 three-year fellowships for study and research at U. S. institutions offering doctoral degrees in the following fields: Electrical Engineering, Computer Science, Naval Architecture and Ocean Engineering, Materials Science, Applied Physics, Aerospace/Mechanical Engineering, Life Sciences, Mathematics and Oceanography. Participants must be citizens or nationals and have received a baccalaureate degree. Fellows selected in 1985 will receive $13,000 for the first year of tenure. In addition, ONR pays the institution full tuition and fees. The Army has provided 25 three-year fellowships annually in 1983-1985 focusing on computer sciences, vertical lift technology and advanced materials. The Air Force supports about 50 fellows annually in the fields of aircraft propulsion technology, vertical lift technology, computer sciences, and manufacturing sciences.

Non-Government

High School

Project SEED. A ten-week summer work experience program administered by the American Chemical Society for economically disadvantaged high school students who have completed 11th grade. Funded colleges and universities recruit their own students. To find out more about participating institutions in your community contact the American Chemical Society, 1155 16th Street, NW, Washington, DC 20036.

NACME-National Action Council for Minorities in Engineering. Provides an Incentive Grants Program to selected colleges for distribution to minority students in engineering. Also sponsors Summer Engineering Employment Project (Project SEEP) to help students augment scholarships with summer earnings and foster skills and relationships leading to permanent employment. For a list of participating colleges and other information, write to NACME, 3 West 35th Street, New York, NY 10001.

Edison/McGraw Scholarship Program. Coordinated by the National Science Teachers Association (NSTA) and Council of State Science Supervisors for the Edison and McGraw Foundations, this program is for junior high and high school students in grades 7-12. To enter, students must submit a proposal, not exceeding 1,000 words or five

pages, of an already completed experiment or a projected idea that deals with a practical application in the fields of science and/or engineering. A student must also submit a letter of recommendation from his or her teacher/sponsor that indicates how the student's work exemplifies the life and work of inventors Thomas Edison and Max McGraw. Finalists are selected and the top two receive $5,000 scholarships, the remaining senior division finalists receive $1,000 each to be paid directly to the college of their choosing. Students must apply by December 1. Send entries to Edison/McGraw Scholarship Program, c/o Dr. Kenneth R. Roy, NSSA Leadership Institute for Science Education, Copernicus Hall (Room 227), Central Connecticut State University, 1615 Stanley St., New Britain, CT 06050.

National Merit Scholarship Program. To participate, applicants take the Preliminary Scholastic Aptitude Test/National Merit Scholarship Qualifying Test (PSAT/NMSQT) in their high schools. Fifteen thousand students nationwide are named Semifinalists and those who become Finalists by meeting requirements compete for a total of 6,000 scholarships worth about $23 million. At least 1,800 win one-time National Merit $2,000 Scholarships awarded on a state basis, and about 5,900 win renewable Merit Scholarships (worth between $2,000 and $8,000 for the four college years) with criteria specified by some 600 corporations, business organizations, and colleges and universities providing grants for support of Merit Scholarships. F or information and a PSAT/NMSQT Student Bulletin describing the competition and scholarships, write National Merit Scholarship Program, One Rotary Center, 1560 Sherman Ave., Evanston, IL 60201.

Intel Science Talent Search. For high school students who demonstrate evidence of research ability by preparing a research project report. 40 winners share $140,000 in scholarships and awards. Deadline each year is December 15. For further details, write Science Education Programs Dept., 1719 N Street, NW, Washington, DC 20036.

National Space Club Scholars Program For High School Students. A student intern program with space scientists and engineers, during six summer weeks, for academically talented students entering the junior or senior year of high school. Provides a small stipend. Applications are due by May 6 each year. For more information, write to National Space Club, 2000 L Street, NW, Suite 710, Washington, DC 20036.

National Science Foundation. NSF offers many programs for students throughout the country. The Young Scholars Programs offers some support for students to conduct individual research. For information and publications dealing with current offerings call 703-306-1234.

College

Audubon Naturalist Society. 11-week sessions four times a year to provide undergraduate and graduate college students on the job experience in the environmental education field. $1,000-$1,200 stipend and possibly housing provided. For information, write Karyn Molines, Education Program Coordinator, 8940 Jones Mill Road, Chevy Chase, MD 20815.

Cooperative Education. Incorporates productive work as a regular part of a student's curriculum, generally in one of three patterns: Parallel study and work, alternating terms or semesters, or limited to summer vacations. Student Co-op earnings average approximately $7,000 per year.

The National Hispanic Scholarship Fund. Provides scholarships for undergraduate students of Hispanic American--Mexican American, Puerto Rican, Cuban, Caribbean, Central American and South American--background and heritage. Applicants must be U. S. citizens presently attending college as full-time students who have completed 15 units of college work prior to applying. Deadline for annual applications is October 1. Contact the National Hispanic Scholarship Fund, P. O. Box 748, San Francisco, CA 94101.

National Space Club. Offers the Dr. Robert H. Goddard Scholarship to students in at least their junior year at an accredited university pursuing undergraduate or graduate degrees in science or engineering. Award is $7,500 plus travel and lodging to attend Goddard Memorial Dinner held in Washington, DC. For information, write to National Space Club, 2000 L Street, NW, Suite 710, Washington, DC 20036.

Appendix 2

RESOURCES ON CAREERS AND SCHOLARSHIPS IN SCIENCE AND ENGINEERING

The first place to obtain information on careers and scholarships is in the high school and public libraries. Descriptions of scientific projects are found in encyclopedias such as ENCYCLOPEDIA AMERICANA, ENCYCLOPEDIA BRITANNICA, and WORLD BOOK ENCYCLOPEDIA. THE BOOK OF POPULAR SCIENCE (Grolier, 6 volumes) is also a good source.

The following publications should also be helpful:

THE A'S & B'S OF ACADEMIC SCHOLARSHIPS, 17th Edition

Lists the major awards offered by the federal government, states, private sponsors, and colleges to students in the top 25% of their high school classes. A list of colleges with honors programs is also provided. Available from Octameron Associates, Box 3437, Alexandria, VA 22302. 1995-96, $7.00 + $1.25 for postage and handling*.

DIRECTORY OF SCIENCE TRAINING PROGRAMS for High Ability Senior and Junior High School Students.

Lists universities with summer programs, usually at expense of student, although some scholarships are available. Science Service, Inc., 1719 N Street, NW, Washington, DC 20036. 1990, $3.00.

NAPD (National Association of Pre-College Directors)

Describes fifteen programs for secondary school students which focus on career choice and preparation in mathematics, science and engineering, and are part of a network provided by NAPD, "Dedicated to Minority Participation in Math, Science and Engineering." Programs include summer residential instruction at colleges, work experience in industry, and curriculum enrichment. Write NAPD, c/o SECME, Georgia Tech, Atlanta, GA 30332.

NEED A LIFT

The American Legion's Education and Scholarship Handbook, which contains information about careers, scholarships and other educational assistance for students. Send orders to American Legion, Dept. S, P.O. Box 1055, Indianapolis, IN 46206. $1.00 each, prepaid.

SUMMER JOBS: Opportunities in the Federal Government, Announcement No. 414

Contains information on agencies participating in cooperative education programs and providing summer employment for high school and college students. Free from U. S. Office of Personnel Management, 1900 E Street, NW, Washington, DC 20415.